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DATE: 25 September 2012

I.T.L. (PRODUCT TESTING) LTD.

FCC EMC Test Report

(Equipment Authorization Under FCC Verification Process)
for

Starcom GPS Systems Ltd.

Equipment under test:

Container Tracker

TRITON

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
Y. Mordukhovitch, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

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1. General Information

1.1 Administrative Information

Manufacturer:	Starcom GPS Systems Ltd.
Manufacturer's Address:	33 Jabotinsky St., Ramat-Gan, 52511, Israel Tel: +972-3-619-9901 Fax: +972-3-619-9954
Manufacturer's Representative:	Vadim Leitman
Equipment Under Test (E.U.T):	Container Tracker
Equipment Model No.:	TRITON
Equipment Serial No.:	310492
Date of Receipt of E.U.T:	09.08.12
Start of Test:	15.08.12
End of Test:	16.08.12
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 71100
Test Specifications:	See Section 2

1.2 Abbreviations and Symbols

The following abbreviations and symbols are applicable to this test report:

AC	alternating current
ARA	Antenna Research Associates
Aux	auxiliary
Avg	average
CDN	coupling-decoupling network
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dbµV	decibel referred to one microvolt
dbµV/m	decibel referred to one microvolt per meter
DC	direct current
EMC	electromagnetic compatibility
E.U.T.	equipment under test
GHz	gigahertz
HP	Hewlett Packard
Hz	Hertz
kHz	kilohertz
kV	kilovolt
LED	light emitting diode
LISN	line impedance stabilization network
m	meter
mHn	millihenry
MHz	megahertz
msec	millisecond
N/A	not applicable
QP	quasi-peak
PC	personal computer
RF	radio frequency
RE	radiated emission
sec	second
V	volt

1.3 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 861911.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1.
6. TUV Product Services, England, ASLLAS No. 97201.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

2. Applicable Documents

2.1	**Code of Federal Regulations Title 47, Federal Communications Commission Part 15, Subpart B.** **Rev. July 12, 2012** **GPO Access Web Site**	*Unintentional Radiators.*
2.2	**ANSI C63.4-2003**	*American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.*

3. Test Site Description

3.1 Location:

The Electromagnetic Compatibility Test Facility of I.T.L. (Product testing) Ltd. Is located at
Telrad Industrial Park, Lod, 71100 Israel.
Telephone: +972-8-9153100
Fax: +972-8-9153101

3.2 Open Site:

The OATS is located on a one floor-building roof. The OATS consists of 3 meter and 10 meter ranges, using a 21.5m X 8.5m solid metal ground plane, a remote controlled turntable and an antenna mast.

3.3 Ground Plane:

The ground plane is made from steel plates, which are welded continuously together. The Ground plane is lies and welded on welded steel construction with vias to allow for water drainage.
All the power, control, and signal lines to the turntable and the 3 m and 10m antenna mast outlets are routed in shielded conduits under the plane to the control building.

3.4 Antenna Mast:

ETS model 2070-2. The antenna position and polarization are remote controlled via Fiber Optical Link using ETS/EMCO Dual Controller Type 2090. The antenna position is adjustable between 1-4 meters. Pressurized air is used to power changing the polarity of the antenna.

3.5 Turntable:

ETS model 2087 series. The position of the turntable is remote-controlled via Fiber Optic Link, using ETS/EMCO Dual Controller Type 2090. The turntable is mounted in a pit and its surface is flush with the Open Site Ground Plane. Brushes near the periphery of the turntable ensure good conductive connection to the ground plane. The Turntable maximum load is 1250 Kg.

3.6 EMI Receiver:

Type HP8542E, including HP85420E R.F. filter manufactured by Hewlett-Packard, being in full compliance with CISPR 16 requirements.

3.7 E.U.T. Support:

Table mounted E.U.T.s are supported during testing on 80 cm high all-wooden tables (no metal nails or screws).

3.8 Test Equipment:

See details in Section 6.

4. System Test Configuration

4.1 Mode of Operation

The E.U.T. was operated in “Ready” mode, with connection to the communication center via cellular module each 10 sec.

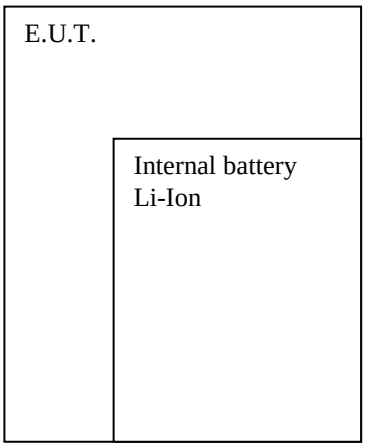


Figure 1. Configuration of Tested System

4.2 Equipment Modifications

No modifications were required in order to achieve compliance.

5. Summary of Test Results

Test	Results
Radiated Emissions FCC Part 15, Subpart B Class B	The E.U.T met the performance requirements of the specification. The margin between the emission level and the specification limit was 13.0 dB in the worst case at the frequency of 500.00 MHz, vertical polarization.

6. Equipment Under Test (E.U.T.) Description

Triton is the smartest system available today for real time tracking of containers, their protection and management. It gives you full control on all possible events and situations with its automatic remote operation, system stability and continuity.

Utilizing its built in sensors and GPS / GPRS facilities for communication the system can detect exactly when a container has reached the customer's area and the recipient can be aware of every movement of the container. Also any damage / blow or breaking into the container will be alerted and reported via the selected communication means i.e. fax, email, SMS etc'.

The Triton is comprised of three main parts:

1. Central Arm – This central part of Triton holds the two side compartments and also the Contact and Door Sensors. This part also contains magnets for fast attachment against the container wall and also two holes in case an attachment with screws is preferred. When installing Triton this part will be fully inserted inside the container. (See description for side compartments and sensors herein under).
2. Battery & CPU, GSM, GPS Compartment (System Core) – This bigger side compartment of Triton contains a battery pack for continuous power support and CPU, GSM, GPS modules including the SIM card slot. The light sensor is located on this part. When installing Triton this part will be fully inserted inside the container.
3. Antennas Compartment – This smaller side compartment of Triton contains the GSM and GPS Antennas. The Operation sensor is located on this part. When installing Triton this part will extend outside of the container.

The E.U.T. includes and FCC approved modem, FCC ID: XPYLEONG100, manufactured by u-blox AG.

7. List of Test Equipment

7.1 Emission Tests

The equipment indicated below by an "X" was used for testing Conducted Emission (**CE**)and Radiated Emission (**RE**)

Test equipment calibration is in accordance with ITL Q.A. Procedure PM 110 "Calibration Control Procedure", which complies with ISO 9002 and ISO/IEC Guide 17025.

Instrument	Manufacturer	Model	Serial No.	Used in Test	
				CE	RE
LISN	EMCO	3810/2BR	1297		
Transient Limiter	HP	11947A	3107A03041		
RF Amplifier	HP	8447F	3113A06386		X
EMI Receiver	Rohde & Schwarz	ESCI7	100724		
EMI Receiver	HP	8546A	3650A00365		X
Receiver RF Filter Section	HP	85460A	3650A00365		X
EMC Analyzer	HP	HP8593	3536A00120		X
Biconilog Antenna	EMCO	3142B	1250		X
Horn Antenna	ETS	3115	6142		
Antenna Mast	ETS	2070-2	9608-1497		X
Turntable	ETS	2087	-		X
Mast & Table Controller	ETS/EMCO	2090	9608-1456		X

8. Radiated Emission

8.1 Test Specification

30-1000 MHz, FCC Part 15, Subpart B, CLASS B

8.2 Test Procedure

The E.U.T operation mode and test set-up are as described in section 4.1.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in *Figure 3. Radiated Emission Test.*

The E.U.T. highest frequency source or used frequency is 12 MHz.

The frequency range 30-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The emissions were measured at a distance of 3 meters.

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

FS = RA + AF + CF

Where:

FS: Field strength [dBµV/m]
RA: Receiver Amplitude [dBµV]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable attenuation Factor [dB]

Example: FS = 30.7 dBµV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBµV

8.3 Test Results

The E.U.T met the requirements of the FCC Part 15, Subpart B ,Class B specification.

The margin between the emission level and the specification limit is 13.0 dB in the worst case at the frequency of 500.00 MHz, vertical polarization.

The details of the highest emissions are given in *Figure 2*.

Radiated Emission

E.U.T Description Container Tracker
Type TRITON
Serial Number: 310492

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal/Vertical
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Frequency	Peak Amp	QP Amp	Antenna Polarization:		Limit	Margin
(MHz)	dBµV/m	dBµV/m	Hor.	Ver.	dBµV/m	(dB)
150.32	22.9	13.1	X		43.5	-30.4
240.00	23.6	18.1	X		46.0	-27.6
350.00	23.3	21.9	X		46.0	-24.1
400.00	30.4	23.9	X		46.0	-22.4
430.00	38.5	32.4		X	46.0	-13.6
500.00	36.4	30.0		X	46.0	-13.0
550.00	36.5	30.5		X	46.0	-15.5
600.00	38.2	31.2		X	46.0	-14.8

Figure 2. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL. Detectors: Peak, Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

9. Set Up Photographs

Figure 3. Radiated Emission Test

10. Signatures of the E.U.T's Test Engineers

Test	Test Engineer Name	Signature	Date
Radiated Emissions	Y. Mordukhovitch		03.10.12

11. APPENDIX A - CORRECTION FACTORS

11.1Correction factors for CABLE

**from EMI receiver
to test antenna
at 3 AND 10 meter range.**

FREQUENCY	CORRECTION FACTOR		FREQUENCY	CORRECTION FACTOR
(MHz)	(dB)		(MHz)	(dB)
30	1.96		700	11.25
35	2.08		800	12.53
40	2.26		900	13.86
45	2.43		1000	14.86
50	2.59		1200	15.7
55	2.65		1400	17.05
60	2.86		1600	18.2
65	2.96		1800	19.4
70	3.04		2000	21.3
75	3.27			
80	3.41			
85	3.54			
90	3.68			
95	3.77			
100	3.93			
110	4.19			
120	4.41			
130	4.6			
140	4.83			
150	5.06			
160	5.35			
170	5.57			
180	5.7			
190	5.84			
200	6.02			
250	6.86			
300	7.59			
350	8.09			
400	8.7			
450	9.15			
500	9.53			
550	9.82			
600	10.24			
650	10.74			

NOTES:

1. The cable type is **RG-214/U**

11.2Correction factors for GAIN Amplifier 8447F 30M-1.3G

FREQUENCY (MHz)	GAIN (dB)
20	27.16
30	27.18
50	27.15
100	27.01
200	26.48
500	27.54
1000	26.96
1100	26.69
1200	26.28
1300	25.85

11.3Correction factors for Bilog ANTENNA

Model: 3142
Antenna serial number: 1250
3 meter range

FREQUENCY (MHz)	AFE (dB/m)	FREQUENCY (MHz)	AFE (dB/m)
30	18.4	1100	25
40	13.7	1200	24.9
50	9.9	1300	26
60	8.1	1400	26.1
70	7.4	1500	27.1
80	7.2	1600	27.2
90	7.5	1700	28.3
100	8.5	1800	28.1
120	7.8	1900	28.5
140	8.5	2000	28.9
160	10.8		
180	10.4		
200	10.5		
250	12.7		
300	14.3		
400	17		
500	18.6		
600	19.6		
700	21.1		
800	21.4		
900	23.5		
1000	24.3		

12. APPENDIX B - MEASUREMENT UNCERTAINTY

12.1 Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

13. Appendix C - FCC Verification Process Instructions

- **Label**

Prepare Label

- Design a FCC compliance label that will be affixed to all units marketed.

- ·The label must include the compliance statement below.

Example of Label:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) This device must accept any interference received, including interference that may cause undesired operation.

Note - The label may also contain other information, such as the model number, the country of origin, etc. (The country of origin information is required by Customs and the Federal Trade Commission for imports to the U.S.)

Small Products:

If the product is too small for a label containing the statement above, the information paragraph required must be placed in a prominent location in the instruction manual or, alternatively, the information can be placed on the container in which the product is marketed.

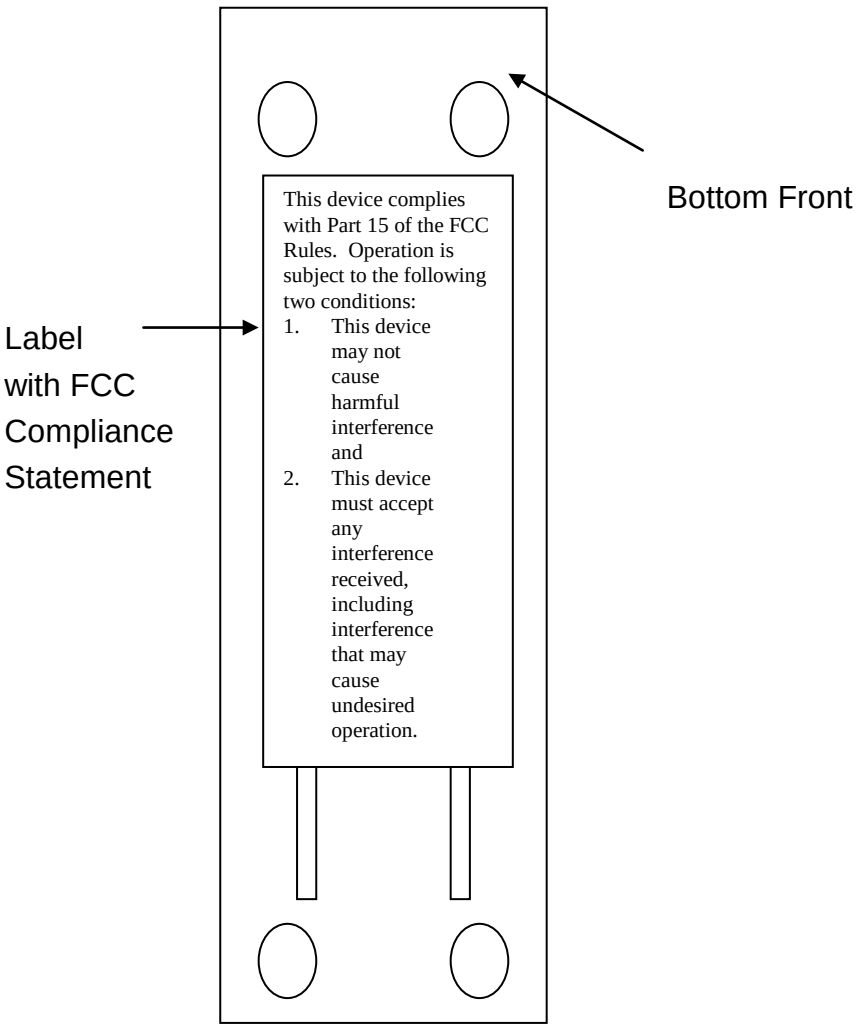
- **Label**

The FCC requires that the compliance statement above be placed in a “conspicuous location on the device.”

The following are the FCC Rules about how the label will be permanently attached.:

> The label is expected to last the life of the product. It must be permanently marked (etched, engraved, indelibly printed, etc.) either directly on the device, or on a tag that is permanently affixed (riveted, welded, etc.) to the device.

Example of Product with Label:


Bottom Front
Label with FCC Compliance Statement
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference and
2. This device must accept any interference received, including interference that may cause undesired operation.

- **FCC Compliance Statement**

FCC Compliance Statement in User's Manual

For a Class A or Class B digital device or peripheral, the instructions given to the user shall include the following, or a similar, statement that should be placed in a prominent location in the text of the manual. (from FCC Rules 15.105)

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. (from FCC Rules 15.21)

Information about any special accessories needed to ensure FCC compliance must also be included.

Sample User Information for a Class A digital device:

The FCC Wants You to Know

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

FCC Warning

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC Rules.

Sample User Information for a Class B digital device:

The FCC Wants You to Know

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

a) Reorient or relocate the receiving antenna.

b) Increase the separation between the equipment and receiver.

c) Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

d) Consult the dealer or an experienced radio/TV technician.

FCC Warning

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC Rules.